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China and Outer Space

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Abstract

China's space program began in the 1950s as part of its nuclear weapons program. Today it spans both civilian and military requirements, as well as bolstering national prestige: China is only the third country, after the United States and Russia, to operate an independent manned space program. The country's ambition may see a Chinese astronaut landing on Mars. In the defensive realm, China is developing a counterspace capability to thwart a future adversary from using their space-based assets against China in time of conflict. While publicly opposed to an arms race developing in space–and China's space white paper strongly backs the United Nations Office of Outer Space Affairs–it recognizes the risks of this occurring. By developing its own space-based capabilities while at the same time renouncing the weaponization of space, China can be: (a) militarily credible, in that it has a program in play to counter any emergent hegemonic practices in space; and (b) diplomatically persuasive insofar as it would like to join the international community in keeping space as a weapons-free zone. The continuity in China's unified, comprehensive effort in space research and development strengthens China's credentials as a global power with a distinctive space policy.

I China's "Peaceful Rise" to Space

The People's Republic of China (PRC) ranks with the United States and Russia in operating independent human spaceflight. It was the first to acquire this capability in the 21st century, and without the trappings of the Cold War that characterized the two superpowers' space achievements last century. The China National Space Administration (CNSA) put a human in space in 2003 in an era marked by China's rapid economic development. It was the same year that China launched its "peaceful rise" slogan to reassure the world that a stronger China did not harbor hegemonic ambitions. Indeed, the very word "rise" was replaced with "development" to leave no doubts about the non-threatening nature of China's growing strength.

"Development" may appear a bland alternative to "rise" but seen from the perspective of outer space, its meaning is magnified by what is yet to come, and the speed with which is it is being accomplished. The mission to put a human in space began under the Shenzhou ("Divine Vehicle") program in 1992. Shenzhou-1 was launched in 1999. The first four spacecraft were unmanned. It was the fifth mission, in October 2003, which saw Yang Liwei become China's first man launched into orbit. The project, in the first decade of the new century "sent six astronauts into space on three occasions and performed a space walk" (Xinhua

2011a). In preparation for landing Chinese astronauts, often called taikonauts,[1] on the Moon by 2025, China also launched two probes: Chang'e-1 in 2007 and Chang'e-2 in 2010.[2]

The timetable for the second decade includes more lunar probes, including one with landing and patrol equipment to collect rock samples, and probes to explore Mars and Venus (Song 2010; Richburg 2011). Beijing's ambition is to send a taikonaut to Mars after the Moon mission, with projections that this 80-million-km journey could occur by 2030 (Huei 2011). China is not alone in the quest for landing humans on the Moon and Mars. The European Union, Russia, Japan and India are planning manned missions to one or both. As for the US, it has turned to the commercial sector for taking astronauts into space. The private company, SpaceX, plans to land an astronaut on Mars by 2030–the same timeframe as China. It is one of two space companies that have been awarded $75 million from NASA to assist in developing a replacement for the space shuttle, which ended three decades of service in 2011. Still, the Moon is more approachable than Mars. The US had landed the first man on the Moon in 1969; no one has landed on Mars. The survival record for probes to Mars is poor (only one-third) and the cost exorbitant. This suggests a multilateral mission is more likely, though a Chinese may yet be the first human to land on Mars.

Meanwhile, in low Earth orbit, China is constructing a manned space station as a staging base for deep-space exploration. The PRC was not invited to join the International Space Station (ISS), so it decided to build its own. Given that the United States, through NASA, is the leading member of ISS,[3] China's exclusion is not surprising. The US fears China's application of dual-use space technology for nefarious purposes and even banned American companies from transferring satellite technology to China. By contrast, China says that in keeping with its policy of opening up to the outside world, its space station would welcome scientists from all countries (David 2011). Provisionally named Tiangong ("Heavenly Palace"), the space station will comprise a central module with two laboratory modules for experiments. A cargo spaceship is also being developed for regular re-supply missions. Chinese citizens were asked to participate in finding a permanent name for the new station and cargo ship, thereby involving them directly in the prestige of space endeavors. The space station's construction began in 2011 and is expected to be complete by 2020, with problems being solved along the way. These included improving technology for cargo supply and for taikonauts to stay in orbit for mid-term missions of 20 days. These were identified as tasks to be completed by 2015, as part of China's the 12th five-year plan (Xinhua 2011b).

China is also building its own global navigational satellite system, Beidou ("Compass"). Beidou has already begun serving China and neighboring countries. The second generation, Beidou-2, will consist of 35 satellites that will provide global services. In April 2011, when China launched its eighth satellite of the system, its officials pointed out that Beidou, unlike the American GPS, provides a text message service. As Beidou's chief designer, Sun Jiadong, explained: "The main feature of Beidou is that it can deliver messages. In other words, if I pick up a cell phone and communicate with Beidou, it can give me my position" (Xinhua 2011c; for details of the Baidou system see Barbosa 2011). Like the US GPS and Russian

[1] This is China's word for astronaut , like Russia's cosmonaut. Taikong is the Chinese word for space.
[2] Chang'e is the name of China's mythical moon goddess.
[3] The others are Russia, Canada, Japan, Brazil, and 11 member nations of the European Space Agency.

GLONASS systems, Beidou also has a military function making it a typically dual-use space technology.

In view of US exclusion of China from ISS and China developing its own space infrastructure for both deep-space and terrestrial projects, a new space race could be deemed to be underway. This time the strategic adversaries would be the United States and the PRC, with China as the rising superpower and the US as the declining one. However, Beijing has been careful to maintain the mantra of its peaceful intentions and the cooperative nature of its space activities. As stated in the PRC's 2010 defense white paper:

> In accordance with the principle of peaceful use of outer space, China has conducted bilateral cooperation and exchanges with Russia, France, Brazil, Ukraine, the United States and the European Space Agency (ESA) in the fields of space technology, space exploration and space science. It supports the work of the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) and Asia-Pacific Space Cooperation Organization (APSCO), and plays an active role in making use of outer space technologies to conduct multilateral cooperation in Earth science research, disaster prevention and reduction, deep space exploration, and space debris mitigation and protection (State Council Information Office 2011).

Beijing believes that the best way to "prevent any weaponization of or arms race in outer space is to negotiate and conclude a relevant international legally-binding instrument" (ibid.). To this end, it has jointly submitted with Russia a draft Treaty on the Prevention of the Placement of Weapons in Outer Space and the Threat or Use of Force against Outer Space Objects (for discussion, see Listner 2011). Indeed, Russia has been its closest collaborator in joint space projects, including the 2010-2012 China-Russia Space Cooperation Outline (Cheng 2009). Both countries have much to gain from countering any emergent hegemonic practices in space as the last frontier. They share an interest in fostering a multipolar world and opposing the US missile defense program.

Moscow's initial, if short-lived, cooperation goes back to the 1950s when in the role of communist ally it provided assistance to China's rocket and satellite program. The Sino-Soviet split of the early 1960s put an end to this, but China's space program was not reliant wholly on Moscow. Expert leadership came through an American-trained Chinese, Qian Xuesen. He returned to China in 1955 after being suspected of being a spy for 'Red China'. This was during the anti-communist hysteria of the McCarthy era in the United States. China had its own political witch-hunt in the 1960s under the Great Proletariat Cultural Revolution when intellectuals were persecuted for not belonging to the ideologically condoned class of workers and peasants. Though there were some delays caused by the turmoil of the Cultural Revolution, China still managed to launch its first satellite, the Dong Fang Hong (DFH-1). It transmitted the revolutionary song of its namesake, 'The East is Red', for the 26 days in orbit. This made China the fifth nation with independent launch capability.

Over the next four decades, China successfully launched well over 100 satellites for commercial, scientific and military use. In 2010 alone, it purportedly launched as many satellites as the United States: 15. Even so, China had only 67 satellites in orbit (civilian and military) compared to the USA's known 441 in total and Russia's 99 (Axe 2010). China's "peaceful rise" to space has not displaced either of the former Cold War warriors. However,

both the American and Russian space programs have seen their heyday whereas China is still looking forward to its apogee. China's expanding space activities and newer infrastructure is reflected in the construction of a fourth space launch centre in Wenchang in the southern island of Hainan.[4] Hainan's proximity to the equator takes advantage of the effects of the Earth's rotation in increasing rocket thrust and thus the launch of heavier payloads. These are necessary for the new Chinese space station and deep space exploration. The Wenchang Satellite Launch Center was approved by State Council and the Central Military Commission in 2008, "for launching new-generation rocket-carriers and space vehicles like geo-synchronous (GEO) satellites, polar-orbiting satellites, space stations and deep-space exploration satellites" (Xinhua 2009).

As a country the size of China becomes even more developed, its reliance on space will increase. Space has become so intrinsic to China's future in promoting its comprehensive national strength that cosmic diplomacy is set to become the "high politics" of the next generation. In this respect, China project manager for the US Union of Concerned Scientists, Gregory Kulacki, made a pertinent remark. Reflecting on opposition in the US to space cooperation with China, lest it acquires knowledge at the US's expense, Kulacki said that China had experienced such a growth in capabilities that the incentive for space cooperation with the US may diminish. He pointedly added: "We need to get past the idea that the Chinese need us more than we need them" (in Foust 2011).

II China's Comprehensive Space Strategy

China's view of space is comprehensive and sustained. According to *China's Space Activities in 2006* (*White Paper*), China seeks:

> to explore outer space, and enhance understanding of the Earth and the cosmos; to utilize outer space for peaceful purposes, promote human civilization and social progress, and benefit the whole of mankind; to meet the demands of economic construction, scientific and technological development, national security and social progress; and to raise the scientific quality of the Chinese people, protect China's national interests and rights, and build up the comprehensive national strength (State Council Information Office 2006).

It is a truism that space exploration cannot be reduced to one motivating factor, such as national prestige, scientific innovation, commerce or military advantage, though it can be employed to enhance all of these. For China it is also a long-term, culturally-imbued activity: ancient Chinese astronomers were the first to record a solar eclipse, to provide early knowledge of astronomical phenomena, and to map the stars for navigation. The "celestial empire" of imperial China may have given way to communist party rule in a people's republic, but space has remained a Chinese preoccupation.

Indeed, the PRC's first white paper on space in 2000 drew attention to China having invented gunpowder and that this was the embryo of modern space rockets (State Council Information Office 2000). It is instructive that before transforming the battlefield through the invention of gunpowder, the ancient Chinese used this explosive mixture for ceremonial

[4] The other three are Jiuquan Satellite Launch Center in the Gobi Desert to China's north; the Taiyuan Satellite Launch Center in Shanxi Province; and Xichang Satellite Launch Center in Sichuan Province.

purposes. Much like the lighting of firecrackers during Chinese New Year celebrations, the noise of the explosion was intended to frighten away evil spirits. Today this intended effect is called deterrence. It is a policy which China adopted soon after its communist revolution in 1949 in order to avoid nuclear blackmail by "foreign devils".

Herein lies the nuclear origins of China's space program and its ultimate control by the Chinese military: the People's Liberation Army (PLA). This remains true today despite the introduction in the 1990s of the China National Space Administration (CNSA), under the Commission of Science, Technology and Industry for National Defense (COSTIND). CNSA is responsible for the enforcement of national space policies, and represents the civilian and international face of China's space program. As far as China is concerned there is no subterfuge. Like yin and yang, the military and civilian aspects of the space program are interrelated. The 2010 defense white paper makes this proposition clear when it states: "The state takes economic development and national defense building into simultaneous consideration" and "adopts a mode of integrated civilian-military development" (State Council Information Office 2011).

Nonetheless there are technical reasons, too, for civilian-military development. When China's space program began in 1956 as part of its nuclear weapons program, the common denominator was the rocketry required for delivering nuclear warheads or launching satellites into space. The twin programs soon diverged in their requirements. A space rocket must carry a heavy payload, and for this the Long March rocket series has become the workhorse of China's space program. A strategic missile, by comparison, needs fast launch times and survivability against enemy first strike. The ancestor of both the Long March space rocket that launched China's first satellite in 1970 and China's strategic missile force was the two-stage intermediate range ballistic missile, the Dong Feng ("East Wind")-4 or DF-4.

A divergence in development between space and nuclear research, however, did not mean the removal of military involvement in space projects. It is here that the technical reason for joint military-civilian development becomes a practical reality too: satellites are an integral part of modern military practice, from communication and surveillance to cueing missiles and targeting. For example, they supply the tracking and targeting information for one of the more recent members of the Dong Feng missile family, the DF-21D. It attracted attention in 2010-11 as the first "carrier killer" anti-ship ballistic missile (ASBM) of its kind (see Dennis 2010; AP 2011). Believed to be capable of hitting US aircraft carriers in the Western Pacific in the event of a Taiwan conflict scenario, it was one of a number of 21st century developments that raised China's reputation as an emerging high-tech power, not just an economic one, with space serving a vital function in its military modernization.

Another development was a direct-ascent anti-satellite (ASAT) missile test in January 2007. Success in destroying an old Chinese weather satellite was overshadowed by international condemnation over the orbital debris it created and the dangers this posed to spacecraft–including the International Space Station. But there was more to the matter than an emphasis on China's delinquent space behavior. The United States is the most advanced user of space-based assets for its terrestrial military functions, including critical data for global positioning, missile warning and communications with its air and naval forces. Without them the US would be globally handicapped. In its annual report to Congress on China's military and security developments the US Department of Defense stated that:

"China's space activities and capabilities, including ASAT programs, have significant implications for antiaccess/area-denial in Taiwan Strait contingencies and beyond." (DoD 2010).

In January 2010, China conducted another test, this time on ground-based mid-course missile interception technology. Beijing was quick to point out that: "The test would neither produce space debris in orbit nor pose a threat to the safety of orbiting spacecraft" (Xinhua 2010). The two tests, in 2007 and 2010, indicated that China had linked anti-satellite and missile defense research that relied on kinetic energy interceptors, commonly referred to as "hit-to-kill" technologies (Lewis 2010). In addition, China was thought to be developing ground-based lasers to disable satellites. China's existing laser ranging stations used to determine satellite orbits and other innocuous activities need not be of military concern (UCS 2007), but in 2006 it was revealed that China had been testing high-energy lasers against American spy satellites as they passed over Chinese territory (Harris 2006). The dual use dilemma is ever-present in American calculations of Chinese intentions.

Although the US may perceive China's ASAT, "carrier killer" and associated undertakings to be provocative, from China's point of view these measures are precisely what is required for its own defense. China's ASAT tests may appear to contradict its long-standing principle of opposing weaponization of outer space, but as the Chinese Ministry of Foreign Affairs explained on the occasion of the 2010 test: China's missile interception test accorded with its defensive military strategy (Xinhua 2010).

It is well to remember Mao Zedong's Active Defense strategy of victory denial and asymmetric warfare is still adhered to. The 2010 defense white paper, like its predecessors, steps its readers through three hierarchically related ideas: (1) China's overarching orientation is to pursue a "national defense policy which is defensive in nature"; (2) China does so by implementing a "military strategy of active defense"; and (3) this translates to winning "local wars under the conditions of informationization" (State Council Information Office 2011).

Active Defense in the current era suggests the defensive use of one strategic theatre (space) for protection of another (China's maritime periphery). This could entail winning "local wars" in the designated "core interests" of Taiwan and the Nansha/Spratly Islands, using the latest technological advances available, especially via space. By developing ASAT capabilities the PRC is simply making use of a space-based version of guerrilla or asymmetric warfare: strike the enemy at its most vulnerable points. The US is blind, deaf, and mute without its space assets.

There is also a political reason for maintaining the military-civilian links in the space program. Just as Mao famously said that "political power grows out of the barrel of a gun," but that the "party controls the gun," so too civilian and military uses of space come under the overarching authority of the Chinese Communist Party (CCP). Western debates as to who really controls the Chinese space program have yet to appreciate this continuity, even strengthening, of policy. The first of the "new historic missions," promulgated by President and Commander-in-Chief, Hu Jintao, in 2004, was really an old one: that the armed forces must consolidate the ruling status for the CCP (see Mulvenon 2009). In the end, China's space program is strategically ideological or "red", but tactically professional or "expert". It

makes the most of civilian expertise, technology, and administrative structures, to promote a powerful, prestigious China that remains under communist party direction.

The other three "new historic missions" for the PLA, having secured the first of CCP survival are: to ensure China's territorial integrity and security to continue national development; to protect its expanding national interests; and to help maintain world peace. These missions go beyond the Taiwan sovereignty issue, in which the DF-21D would presumably play its "carrier killer" (deterrent or even war-fighting) role. They extend to protecting vital transport routes in the Persian Gulf and Indian Ocean, as well as setting up a global regime in which norms of cooperation are privileged over the quest for security through preponderant power. Given that the United States is the paramount power in space, it is rational for China to help change the rules of the game by advocating an ideology of the peaceful use of space. Dual-use space technologies would then come under normative influence and not only legal constraint.

So while publicly opposed to an arms race developing in space, the PRC recognizes the risks of this occurring. This justifies China's Active Defense strategy of developing a counterspace capability to thwart a future adversary from using their space-based assets in time of conflict, including the possibility of ballistic missile defense systems invalidating China's nuclear deterrence. The rhetoric of peace and the promotion of space treaties sets in play a more multipolar doctrine that not only disperses power but also softens it. China is a great supporter of Military Operations Other Than War (MOOTW, see State Council Information Office 2011); they give the military a better image in these times of non-traditional security threats, conforming with the PLA's requirements to be both a political army and a professional one. MOOTW highlight the difficulty of separating civilian from military use of space, especially when civilian assets need to be protected from damage. This is well expressed by the European Commission, in its 2011 document, *Towards a Space Strategy for the European Union that Benefits its Citizens*:

> Space infrastructure is critical infrastructure on which services that are essential to the smooth running of our societies and economies and to our citizens' security depend. It must be protected and that protection is a major issue for the EU that goes far beyond the individual interests of the satellite owners. Such infrastructure is at risk of damage or destruction by natural phenomena, such as solar radiation and asteroids, and by other spacecraft and their debris. It is also under threat from electromagnetic interference, be it intentional or otherwise (European Commission 2011; for commentary, see de Selding 2011a).

The European Space Agency (ESA) began a "space situational awareness" (SSA) program in 2008 to track the orbital realm for both civilian and defense requirements. The US also began a SSA development program in 2008. Its tasks included the ability to "sense and attribute" a laser attack (O'Neill 2008). China's reported laser "illumination" of American spy satellites come to mind. This demonstrates the fine line between MOOTW in the cause of non-traditional security threats and the weaponization of space.

A certain level of competition is inevitable, especially as the number of spacefaring nations increases. Already the EU, USA, Russia, China, Japan and India are all engaged in space surveillance, irrespective of whether this activity is called situational awareness. Unless a treaty and norm based approach is taken, provocations in space may increase. Space, like its

terrestrial counterpart, needs institutions of good governance if the law of the celestial jungle is to be avoided. Here space surveillance (or SSA) may be put to constructive use in verifying compliance with treaties and codes of conduct. A panel on space situational awareness was included in the National Space Symposium in the US in 2011. A US State Department representative, Frank A. Rose, said that the "picture of the space environment is greatly enhanced through international cooperation," giving examples of "sharing SSA information as well as pursuing initiatives such as the EU's proposal for an international Code of Conduct" and a study of "long-term sustainability of space activities" (Rose 2011). Also addressing the National Space Symposium was Chinese space official, Lei Fanpei, who called for closer cooperation with the United States in three areas: 1) "open commercial access of each nation to the other's capabilities in satellites and launch vehicles"; 2) "manned spaceflight and space science, particularly in deep space exploration"; and 3) "satellite applications including disaster monitoring and management" (de Selding 2011b).

Lei Fanpei pointed out that in the 1990s, before the US ban on the export of satellite components to China, more than 20 American-built commercial satellites were launched by Long March rockets. The US ban has not stopped China from exploring other avenues of space commerce, among the most notable being "a telecommunications satellite product line that has been bundled with a Chinese Long March vehicle to offer in-orbit delivery of telecommunications spacecraft to a half-dozen nations that in many cases can offer China access to their crude oil reserves" (de Selding 2011b).

China has a key role to play as the most significant rising power of the 21st century. By developing its own space-based capabilities while at the same time renouncing the weaponization of space, China can be: (a) militarily credible, in that it has a program in play to counter any emergent hegemonic practices in space; and (b) diplomatically persuasive insofar as it would like to join the international community it keeping space as a weapons-free zone. Or, to express it in Chinese dialectical terms, it represents a distinctive space policy in which the yin of Active Defense secures the prospects for the yang of cooperative governance which, in turn, promotes a common security. National prestige would find ample outlets through participation in joint exploration missions that might have otherwise eluded individual national budgets and expertise. The International Space Station has demonstrated the benefits of cooperation even if its exclusion of China indicates a capacity for politicization. Space diplomacy is still an evolving affair. China's rapid emergence as a space player is likely to change the prevailing "balance of power" but not in any dramatic fashion. It is more likely to occur in a measured and methodical way if the heavens are to reflect Chinese strategy on Earth.

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